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| 10/647,297 | 08/26/2003 | Hyun Huh | 47881-000003/US | 2580 |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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|------------------------------|--------------------------------------|-----------------------------------|
| Office Action Summary | Application No. 10/647,297 | Applicant(s) HUH ET AL. |
| | Examiner Hai Vo | Art Unit 1794 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If no period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 05 November 2007.

2a) This action is FINAL. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1 and 3-31 is/are pending in the application.

4a) Of the above claim(s) 17-31 is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) Claim(s) 1, and 3-16 is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892)
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
 3) Information Disclosure Statement(s) (PTO/136/08)
 Paper No(s)/Mail Date _____

4) Interview Summary (PTO-413)
 Paper No(s)/Mail Date _____

5) Notice of Informal Patent Application
 6) Other: _____

1. The 102/103 art rejections over Molnar et al (US 6,267,644) are withdrawn in view of the present amendment. However, the 103 art rejections over Molnar in view of James et al (US 6,069,080) are maintained.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 5 recites the limitation "the hydrophilic compound" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 3-6, and 9-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Molnar et al (US 6,267,644) further in view of James et al (US 6,069,080).
Molnar discloses a polishing pad comprising a polishing layer composed of a polymeric matrix and finishing aids 27 substantially dispersed in the polymeric matrix as shown in figure 4. The finishing aids are selected from a group consisting of a lubricating aid and chemically reactive aid and both being free of an encapsulating film (column 40, lines 3-6). The lubricating aids include liquid and solid lubricants

and mixtures thereof (column 24, lines 23-25). The liquid lubricants comprise silicon oils, aromatic mineral oils (column 24, lines 30-32; column 25, lines 12-15). The polymer matrix is made from polyurethane resin (column 11, lines 30-35). The polishing pad further comprises a polymeric lubricant such as polyethylene glycol which has a molecular weight of 200 to 2000 (column 24, lines 1-5). The polishing pad comprises a reinforcing layer which is integrally bonded to the finishing element finishing surface layer (column 10, lines 15-20). Molnar teaches the liquid lubricants *dispersed throughout* the polymer matrix (column 24, lines 35-40). That is exactly the way the claimed liquid microelements are present in the polymeric matrix. Therefore, it is not seen that the same mechanisms would not have happened. "As polishing is continuously performed, the polishing layer surface is partially worn away or ground, exposing embedded liquid microelements. The exposed embedded liquid microelements form pores serving to collect and supply the polishing slurry". Similarly, it is not seen that the pores could have an average pore size outside the claimed range as Mohnar uses the same liquid microelements as Applicants, i.e., silicone oils, aromatic mineral oils for boundary lubricants.

Molnar does not specifically disclose the hydrophilic polymeric matrix. James, however, teaches a polishing pad for use in the manufacture of semiconductor devices comprising a hydrophilic matrix material comprising hydrophilic polyurethane made by polymerizing an ethylene oxide in the presence of glycerol (column 5, lines 50-60). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use hydrophilic

polyurethane as the polymeric matrix of Mohnar motivated by the desire to provide a polishing pad that is more readily wet and therefore sufficiently hydrophilic.

Mohnar discloses the polymeric matrix further comprising polyethylene glycol. However, Mohnar does not specifically disclose the amount of polyethylene glycol present in the polymeric matrix. James teaches the hydrophilic urethane matrix including polyethylene glycol with a molecular weight of 200-10000 and present in an amount of 20 to 60% by weight of the matrix material (column 5, lines 50-55; and column 9, lines 1-5). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to add polyethylene glycol in the urethane matrix material motivated by the desire to lower the modulus of the material, thereby making the phase more to wear, to dissolving or to otherwise diminishing during polishing.

Mohnar discloses that the boundary lubricant have been supplied in an effective amount from the polishing surface to reduce the coefficient of friction between the polishing surface and workpiece surface to be polished, thereby reducing the unwanted surface damage to the surface of the workpiece being polished during finishing. Therefore, in the absence of unexpected results, it would have been obvious to one having ordinary skill in the art at the time the invention was made to supply the boundary lubricant from the polishing surface in an amount instantly claimed motivated by the desire to reduce the coefficient of friction between the polishing surface and workpiece surface to be polished, thereby reducing the unwanted surface damage to the surface of the workpiece being polished during

finishing. This is in line with *In re Aller*, 105 USPQ 233 which holds discovering the optimum or workable ranges involves only routine skill in the art.

It appears that Molnar as modified by James uses the same material to form the polishing pad as Applicants and both products serve the same purposes, hence, it is not seen that the open pores which are defined by the embedded liquid lubricants could not have been formed across a surface of the polishing layer as like material has like property. The same token is applied to the semi-transparent property of the polishing layer.

Molnar does not specifically teach the polishing pad having a flow channel on the surface. James discloses the polishing pad having a flow channel on the surface (column 13, lines 20-40). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form a structure having a flow channel on the surface of the polishing layer motivated by the desire to facilitate removal of dross during polishing and enhance the polishing action by exposing a greater number of microelements.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Molnar et al (US 6,267,644) in view of James et al (US 6,069,080) as applied to claim 1 above, in view of Merchant et al (US 6,364,744). Molnar teaches that the polishing pad comprises a reinforcing layer that is integrally bonded to the finishing element finishing surface layer (column 10, lines 15-20). This reads on Applicants' support layer which a seamless interface with the polishing layer. Molnar does not teach a transparent reinforcing layer. Merchant, however, teaches a chemical mechanical

polishing system comprising a support layer 25' and a polishing layer 24' attached to a top surface of the support layer as shown in figure 4. Merchant discloses the polishing layer and the support layer being transparent (column3, lines 48-50). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the transparent support layer motivated by the desire facilitate the light transmission through the polishing layer, thereby enhancing the photocatalytic process for breaking down water into hydrogen and oxygen in the presence of light. As a result, the released oxygen significantly enhances the oxidation of the metal surface during CMP.

7. Claims 8 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Molnar et al (US 6,267,644) in view of James et al (US 6,069,080) as applied to claim 1 above, in view of Reinhardt et al (US 5,578,362). Molnar does not specifically teach a polishing pad comprising hollow polymeric microelements embedded in the polymeric matrix and open pores defined by the hollow polymeric microelements are also distributed across the surface of the polishing layer. Reinhardt, however, teaches a polymeric polishing pad comprising hollow polymeric microelements embedded in the polymeric matrix and open pores defined by the hollow polymeric microelements are also distributed across the surface of the polishing layer as shown in figure 3 (claim 1). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to embed the hollow polymeric microelements in the polymeric matrix motivated by the desire to reduce the effective rigidity of the surrounding portion of the polymeric matrix,

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thereby providing at least two levels of hardness in the polishing pad, i.e., the work surface being softer than the subsurface (see Reinhardt, column 6, line 65 et seq.). Molnar does not specifically teach the polishing pad having a flow channel on the surface. Reinhard discloses the polishing pad having a flow channel on the surface as shown in figures 7 and 8. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form a structure having a flow channel on the surface of the polishing layer motivated by the desire to facilitate removal of dross during polishing and enhance the polishing action by exposing a greater number of microelements (see Reinhardt, column 8, lines 65-67).

8. Claims 11 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Molnar et al (US 6,267,644) in view of James et al (US 6,069,080) as applied to claim 1 above, in view of Bruxvoort et al (US 5,958,794). Molnar does not specifically disclose the lubricating oils having a content as recited by the claims. Bruxvoort, however, teaches a polishing pad for polishing wafer comprising 40% to 75% by weight of the plasticizer based on the total weight of the polymeric matrix (column 2, lines 65-67). Brixvoort discloses the plasticizer including silicone oils, and castor oils. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the lubricating aids in an amount in the range instantly claimed motivated by the desire to provide cushioning effects during polishing, increase the erodability of the polishing pad and significant cost savings because plasticizer is typically less costly than the polymer matrix.

The pore size and the average diameter of the liquid lubricants are regulated by the amount of the liquid lubricant present in the polymeric matrix in view of the teachings of the present invention. The lubricating oils of Molnar as modified by Bruxvoort are uniformly dispersed in the polymeric matrix in an amount within the claimed range, therefore, it is the examiner's position that the pore size and the average diameter of the liquid lubricants would be substantially inherently present.

Response to Arguments

9. The art rejections over Molnar in view of James have been maintained for the following reasons. Applicants argue that the polishing pad of Mohnar differs from that of the present invention. The examiner respectfully disagrees. The liquid lubricants used in the Mohnar patent are silicone oils, aromatic mineral oils (column 24, lines 30-32, column 25, lines 12-15). They are the same materials set forth in the claims. Applicants argue that the Molnar and James patents use polyethylene glycol as a plasticizer to reduce the modulus of the material. Applicants state that in the present invention, polyethylene glycol forms a chemical combination with urethane in forming the hydrophilic matrix. The arguments are not found persuasive for patentability because nothing specific about a chemical reaction of polyethylene glycol with urethane is presently claimed. Additionally, as previously discussed, James teaches a polishing pad made from a hydrophilic polyurethane made by polymerizing an ethylene oxide in the presence of glycerol (column 5, lines 50-60). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use hydrophilic polyurethane as the polymeric matrix

of Mohnar motivated by the desire to provide a polishing pad that is more readily wet and therefore sufficiently hydrophilic.

In response to applicant's argument that the use of the liquid and the hollow polymeric microelements together is to optimize the performance of CMP, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

Applicants argue that in the present invention, oil is randomly dispersed within the polymeric matrix so as to form the open pores distributed across the surface of the polishing layer. On the other hand, Applicants add that oil in the Bruxvoort acts as a plasticizer which is uniformly dispersed within the polymeric matrix. The arguments are not found convincing for patentability because nothing in the claim is specific about how the liquid non-water soluble microelements are present within the polymeric matrix. Since oil in the Molnar and Bruxvoort patents is related to the lubricant aids and there is a guidance to use the lubricating aids in an amount in the range instantly claimed. Accordingly, Molnar is properly combinable with Bruxvoort to establish a *prima facie* case of obviousness.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hai Vo whose telephone number is (571) 272-1485. The examiner can normally be reached on Monday through Thursday, from 9:00 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rena Dye can be reached on (571) 272-3186. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

HV

/Hai Vo/
Primary Examiner, Art Unit 1794